ISSN (Online): 2456-0448
International Journal Of Innovative Research In Management, Engineering And Technology
Vol. 3, Issue 4, April 2018

Statistical Distance Estimation Algorithms With Rss Measurements For Indoor Lte-Networks

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Abstract: ***Cooperative Intelligent Transportation Systems, mainly represented by vehicular ad hoc networks (LTE-As), are among the key components contributing to the Smart City and Smart World paradigms. Based on the continuous exchange of both periodic and event triggered messages, smart vehicles can enhance road safety, while also providing support for comfort applications. In addition to the different communication protocols, securing such communications and establishing a certain trustiness among vehicles are among the main challenges to address, since the presence of dishonest peers can lead to unwanted situations. To this end, existing security solutions are typically divided into two main categories, cryptography and trust, where trust appeared as a complement to cryptography on some specific adversary models and environments. Where the latter was not enough to mitigate all possible attacks. In this paper, we provide an adversary-oriented survey of the existing trust models for LTE-As. We also show when trust is preferable to cryptography, and the opposite. In addition, we show how trust models are usually evaluated in LTE-A contexts, and finally, we point out some critical scenarios that existing trust models cannot handle, together with some possible solutions.***

I. INTRODUCTION

Wireless positioning technologies have been continuously studied and promoted over the past few decades due to the increased demands of location information with the advancement of wireless communication systems [1]. In recent years, location-based services (LBS) are widely integrated in practical applications, such as navigation systems, location based billing, health care systems, and intelligent transportation systems (ITS). The evolution of positioning purposes migrates from simple requirements to various commercial applications, which ensures the integration of LBS into future telecom standards and services. Wireless cellular networks and global positioning systems (GPS) are the two major telecom infrastructures that have been utilized for wireless localization in outdoor environments. In order to extend transmission coverage both in outdoor and indoor wireless macrocell networks, remote radio head (RRH) in microcells and home eNodeB (HeNB) in femtocells have been developed as small cells to cooperate with macro base stations (BSs). Distance information is an essential and intuitive knowledge before conducting positioning algorithms. Various range-based information, such as time of arrival (TOA), time difference of arrival (TDOA) and received signal strength (RSS), can be measured at a mobile station (MS) in wireless networks to facilitate the location estimation process. To obtain signal propagation time, additional communication hardware is required to provide synchronization among the BS. On the other hand, a distance estimation can be obtained from an RSS measurement with the knowledge of attenuation characteristics of transmitted signals. An RSS signal that is logarithmically proportional to the distance between an MS and a BS will be dominated by different attenuation factors and fading effects which correspond to various network environments. Many localization methods proposed for outdoor/indoor wireless sensor networks (WSN) or wireless local area network (WLAN) adopt RSS measurements to estimate MS's position. However, the acquisition of distance information from RSS measurements is not trivial before conducting the location estimation algorithms. The method in [21] adopts the Lambert W function to estimate distances from the transmission loss on power measurements for underwater acoustics sensor networks (UASN). The Kalman filter is used in outdoor WSN to estimate distances from the RSS measurements [10] which are modeled by Longley-Rice and Nakagami distributions. In [22], the linear minimum mean square error (LMMSE) distance estimator is proposed to reduce the bias and mean square error (MSE) from growing exponentially with the noise power. It is shown in [6-8] that the bias and MSE are bounded within the noise power in LMMSE estimator. However, the methods in [9]–[11] do not consider the effects of mixed line-of-sight (LOS)/non-line-of-sight (NLOS) condition or the time-variant channel characteristics which are critical issues in indoor environments. Based on the lognormal model for path loss measurements [12], different methods have been proposed to estimate the channel characteristics in a time-variant or new environments. Several techniques are proposed in [13] to estimate path loss exponent (PLE) with the schemes based on known probability distribution of inter-sensor distances, Cayley-Menger determinant, and pattern matching in WSNs. However, the sensor nodes must frequently sense and report RSS measurements in order to immediately calibrate PLE as described in [20], which consumes excessive energy

and will be harmful to the lifetime of power-limited sensor networks. Furthermore, dynamic PLE is estimated in vehicular networks using Doppler effect and RSS measurements [14]. Although this scheme is mainly designed for network nodes with mobility, the clock shift between transmitters and receivers will cause frequency uncertainties against the accuracy of Doppler shift. Two learning-based methods are proposed in [15] to estimate distance with collected RSSI measurements. The linear and exponential regression method is used to model the relationship between RSSI measurement and distance in a testing region. On the other hand, the estimated distance is obtained by adopting an three-layered artificial neuron network (ANN). However, no regulation protection mechanism is designed for these methods, and it will cause a fundamental over- fitting problem in realistic applications. In [16], multiple RSSIbased ranging models are proposed to estimate distances.

II. LITERATURE SURVEY:

Xin Ming Zhang, Yue Zhang, Fan Yan, And Athanasios V. Vasilakos. "Interference-Based Topology Control Algorithm For Delay-Constrained Mobile Ad Hoc Networks", measures the average end-to-end delay of CBR packets received at the destinations with increasing traffic load. Delay alone is concentrated. In ITCD, transmission power is minimized while keeping the connectivity and packet collisions are taken into account. Mobility is also considered to remove un-stable links in the topology [17].

R. G.Li and A. Eryilmaz, proposed three different algorithms with different complexity and characteristics. "Scheduling for end-to-end deadlineconstrained traffic with reliability requirements in multihop networks," IEEE/ACM Trans. Netw., vol. 20, no. 5, pp. 1649–1663, Oct. 2012 [18]. This algorithm describes the challenging problem of designing a scheduling policy for end-to-end deadline-constrained traffic with reliability requirements in a multi-hop network. Scheduling alone is described.

X. Zhu, P. Li, Y. Fang, and Y. Wang,

"Throughput and delay in cooperative wireless networks with partial infrastructure," proposed Hybrid wireless networks have been shown to scale only when the number of base stations is on the same order of the number of nodes in the network [2-5]. It is proposed to use distributed MIMO technology in hybrid wireless networks. We first employed a resource allocation strategy such that a source and a destination communicate in the ad hoc mode only when they are in the same cell [19].

P. Li, C. Zhang, and Y. Fang, they are proposed the throughput capacity and the average packet delay are taken into account in our work. "Capacity and delay of hybrid wireless broadband access networks," IEEE J. Sel. Areas Commn., vol. 27, no. 2, pp. 117– 125, Feb. 2009.An optical network is too costly to act as a broadband access network. On the other hand, a pure wireless ad-hoc network with n nodes and total bandwidth of W bits per second cannot provide satisfactory broadband services since the per node throughput diminishes as the number of users increase. We find that for most of the cases, hybrid wireless networks have greater throughput capacity and smaller average packet delay than pure ad hoc network.

D. Y. Xue and E. Ekici,they are proposed, A cross-layer framework is going to be finally built which tries to obtain the optimal throughput arbitrarily close for a general multi-hop wireless network."Delay-guaranteed cross-layer scheduling in multihop wireless networks," IEEE/ACM Trans. Netw., vol. 21,no. 6, pp. 1696–1707, Dec. 2013.The throughput is "-close" to the optimal throughput in multihop wireless networks with tradeoff of in average end-to-end delay. The algorithm guarantees finite buffer sizes and aims to solve a joint congestion control, routing, and scheduling problem in a multi- hop wireless network. But only congestion control is concentrate.

III. EXISTING SYSTEM

Differently from existing surveys, where works are classified based on the revocation target (entities, data, and both), in this work we also emphasize the studied

adversary models, in addition to clarifying the main differences between trust-based and cryptography-based solutions, highlighting the advantages and drawbacks of the proposed solutions in each category, and defining a security model able to combine both strategies.

DISADVANTAGES

- High energy consumption.
- Increased Delay and Jitter.
- Non-Uniform load distributed.

PROPOSED SYSTEM

LTE-A security requirements are divided into five main axes in addition to the privacy concerns: availability, authenticity, confidentiality, integrity, and non-repudiation [20]. However, in LTE-A

environments, attacks addressing availability are the most dangerous since

they directly affect safety-critical situations. In the following sections we describe the different LTE-A security requirements, and we then classify the main existing threats. It Avoid the traffic. Balance the load and reduces Energy consumption.

SYSTEM DESIGN:

METHOD SPECIFICATION:

ALGORITHM:

- The Ad hoc On Demand Distance Vector (AODV) routing algorithm is a routing protocol designed for ad hoc mobile networks. AODV is capable of both unicast and multicast routing.

- It is an on demand algorithm, meaning that it builds routes between nodes only as desired by source nodes. It maintains these routes as long as they are needed by the sources.
- Additionally, AODV forms trees which connect multicast group members. The trees are composed of the group members and the nodes needed to connect the members.

Fig. 1. AODV uses sequence numbers to ensure the freshness of routes. It is loop-free, self-starting, and scales to large numbers of mobile nodes.

RREP MESSAGES:

Fig. 2. When a RREQ reaches a destination node, the destination route is made available by unicasting a RREP back to the source route.

- A node generates a RREP if:

TABLE I. It is itself the destination.

TABLE II. It has an active route to the destination. Ex: an intermediate node may also respond with an RREP if it has a

"fresh enough" route to the destination.

RERR MESSAGES:

- This message is broadcast for broken links
- Generated directly by a node or passed on when received from another node

ADHOC ROUTING:

- If the source has no route to the destination , then source initiates the route discovery in an on-demand fashion
- After generating RREQ, node looks up its own neighbor table to find if it has any closer neighbor node toward the destination node.
- If a closer neighbor node is available, the RREQ packet is forwarded to that node.
- If no closer neighbor node is the RREQ packet is flooded to all neighbor nodes.

HYBRID ALGORITHM APPLIED IN NETWORK:

- The basic design philosophy of HRTC is based on the fact that the conditions in WSNs are possible to change dynamically.
- Thus, it is possible for a densely deployed network to initially exist, but after some time this to transform into a network full of routing holes or disconnected parts either due to network issues, In either case, the target of this work is to find a solution that maximizes the efficiency of the network in terms of throughput and lifetime, using effectively the available network resources**.**

CONGESTION CONTROL:

- Congestion is a problem that affects all types of networks. Especially for the low-powered, unreliable Wireless Sensor Networks (WSNs), the occurrence of congestion could negatively affect not only the

- Performance of the network (throughput, delay, packet loss), but also its lifetime as well as its mission. Currently, research converges in two methods for the solution of the problem of congestion in WSNs: traffic and resource control.

  - Traffic control (TC) is the method that has been employed by the majority of congestion control algorithms in WSNs the last few years. Algorithms that employ this method, attempt to limit the data rate of the sources until congestion is mitigated.

IV. CONCLUSION:

Considering the characteristics of path loss in indoor LTEA networks, two distance estimation algorithms are proposed in this paper based on the RSS measurements. The statistical inference distance estimation (SIDE) method is proposed to estimate distances from RSS measurements with mixed sights in indoor LTE-A networks. By means of the theorem of law of large number (LLN) and the large deviations theory, the proposed SIDE algorithm is proved to approach as aconsistent estimator when particle number is no less than a derived theoretic lower bound given a required confidence level (CL) and an error constraint. Moreover, the particle-based distance (PDE) algorithm is proposed to estimate distances with the consideration of alleviating computational overheads in SIDE algorithm without sacrificing significant performance. The distance estimations are obtained by adopting the technique of particle filtering with RSS measurements. Through a finite resampling mechanism with small number of particles, the survived particles can mitigate slow fading effects and compensate indoor penetration losses due to abounding diversities. From the observations in simulation results, the requirements on confidence level and error constraint are met in the proposed SIDE algorithm. Moreover, the proposed PDE algorithm can outperform other methods under different environments and indoor parameters. Benefiting by saving the cost of additional communication hardware, the proposed PDE algorithm can effectively estimate distances with RSS measurements to facilitate the developments of location-based services in indoor LTE-A networks.

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